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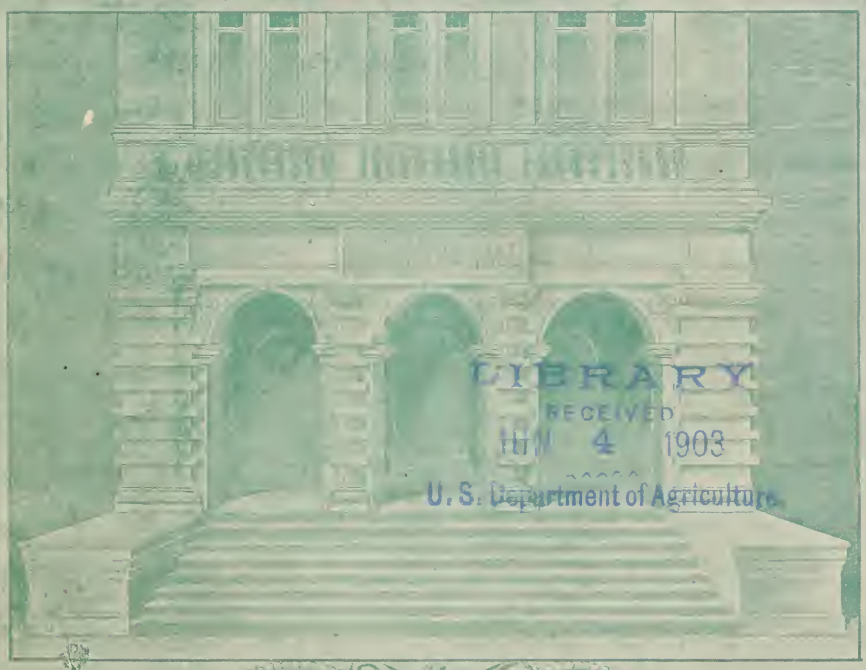
Vol. VIII. MAY, 1902. No. 9.

THE AGRICULTURAL STUDENT



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FOR MAY

Country Life in America for May is a timely number of this large and superb magazine containing, notably, some remarkable photographs of live trout and of brook fishing. A second installment of the "Country Home Making" series gives practical suggestions for laying out and grading the land. An illustrated article shows how a golf course for home playing can be satisfactorily made in a small stretch of ground. Other features concern the varied pursuits and things of the country: the value of "Our Mountain Forests" is told by Dr. Chase P. Ambler, with many beautiful pictures of the Southern Appalachians; "Glimpses of Brook Life" treats of the plants and animals found along the streams; and "The Inspirations of a Great Farm" tells of the development of profitable dairy herds and of business methods in farming; while "The Nursery and Nurserymen" offers information about plant-raising, with hints about transplanting. Among the timely articles on nature are "The Round of the Song Sparrow's Life" and "An Acquaintance with Screech Owls," both with remarkable photographs of the live birds, their nests and young—giving life-histories of the popular spring songster and the night-wanderer; and "The Mountain Goat," as a peculiarly American game animal, is the subject of an illustrated article by Dr. C. Hart Merriam. The calendar of all the work and recreation of the outdoor world is, this month, a profusion of May flowers and birds' nests, with a great deal about gardening and floriculture and sports. In all, *Country Life in America* is certainly the most beautiful of magazines and the representative journal for those who love the country.

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H. A. CLARK. E. L. SHAW. H. L. BELDEN

A. E. DAY. J. T. DALLAS.

THE AGRICULTURAL STUDENT.

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EDITORIAL CHAT.

The prospects for a successful graduate school of agriculture during the coming summer give cause for a feeling of gratification among the instigators of the plan. This being the first school of its kind, it has naturally caused considerable comment among the various agricultural colleges of the country, and the interest which has been shown in the undertaking is very indicative of its success.

Neither time nor money have been spared in preparation for the session and the men who will give instruction along the various lines are the best in the country. The advantages that will be offered are being appreciated, as is shown by the number of students that have already signified their intention of attending. Up to the present time (April 19) sixty-five persons have been enrolled, representing twenty-eight states, as follows: Ohio, 14; New York, 9; Illinois, 4; Indiana, Mississippi, North Carolina, Pennsylvania, 3 each; California, Idaho, Iowa, Missouri, District of Columbia, 2 each, and Alabama, Arkansas, Colorado, Florida, Georgia,

Kentucky, Maryland, Massachusetts, Michigan, New Hampshire, New Mexico, South Dakota, Tennessee, Utah, West Virginia and Wisconsin, 1 each.

We are confident that those who do not attend the school where it is possible to do so, will miss a rare opportunity for improvement.

The oleomargarine bill has been supplying a topic for editorial comment in the various agricultural papers for some time, and we had hoped that in this issue the bill could be announced as a law. Such was not to be the case, however, for although it has been passed by both the house and senate, the alterations in the bill made by the latter body necessitated its being returned to the house for approval. This has been done, and as we go to press it is dangerously entangled in the affairs of the house committees with very serious complications pending. It would be very unfortunate for the bill to fail after so nearly having become a law, for the justness of the measure cannot be doubted. The dairymen of the country will await anxiously the result of the deliberations of the committees.

Mention is made elsewhere in this issue of a movement which has been inaugurated in Michigan, looking toward a solution of the rural social problem. It is indeed gratifying to those interested in the advancement of agriculture and the bettering of rural conditions to observe the sentiment that is arising in regard to the elevation of rural affairs to a higher plain and the uplifting of the rural masses. The task is a peculiarly difficult one and will take time and labor in its accomplishment, yet with the progress that has already taken place and the rapidly changing views which people in general are coming to hold regarding agriculture, we cannot but feel confident of a much wider development of rural social and educational affairs in the near future.

It is quite evident that the young men of the country do not appreciate the opportunities offered to graduates of our agricultural colleges. The calls for young men thoroughly trained along agricultural lines come from commercial concerns as well as from men interested in the teaching or practice of agriculture, and in our best institutions today the demand cannot be supplied. The advantages offered for capable men are as great as those in other lines of work, and there is no reason why we should not see a steady increase in the number of students in our agricultural colleges as these facts come to be recognized. We feel that the instruction offered in agriculture and allied subjects at our own University is equal to that of any institution of its kind in the country and the confidence which outsiders place in the preparation of its students is shown by the large number of inquiries for trained men which are received each year. The rapid advancement that has taken place along agricultural lines in recent years and the recognition of the fact by practical men in all enterprises that agriculture is too complex a science to be grasped by men without an agricultural training, have made it imperative that the men graduated from our agricultural schools shall have had a thorough and systematic training, such as only a complete and competent corps of instructors can give. It is hoped that the young men of the country will soon come to appreciate the care that is being taken by such institutions, to prepare broad and thorough courses in agriculture, and that they will take advantage of the opportunities offered.

The report of the Bureau of Soils, of the U. S. Department of Agriculture, for 1900, has just been issued and is a very interesting publication. It was greatly delayed in its appearance by

reason of a fire which destroyed some of the material for the production of the maps, occasioning the need of having them re-engraved in some cases. The territory covered by the survey during 1900 included areas in various eastern and western states, Montgomery County, Ohio, being one of the areas mapped. The publication includes reports on the soils, crops and agricultural conditions of each area, together with a detailed map of the region showing the location and extent of each soil type. The report may be obtained through congressmen.

Irrigation.

When irrigation is mentioned we almost invariably think of it in connection with the more or less arid lands of the west, where it is best known and most used. The first irrigation in this country after its discovery was by the Spanish 70 years before Jamestown was settled. There is at present a ditch in use at Las Cruces, New Mexico, which they constructed and which has been in use for 300 years.

It is estimated that in 1847 there were 138,250,000 acres of irrigated land in the world under cultivation, supporting 800,000,000 people. It was not until that year, when the Mormons under Brigham Young, turned aside City Creek, Utah, upon the arid plains, that irrigation was attempted by the Anglo-Saxon race. Before this time some work had been done in America by the Indians and Peruvians as well as the Spanish mission fathers. In 1542 Coranado found several tribes of aborigines in Arizona supporting themselves mostly by tilling the soil, and widely scattered ruins of irrigating ditches, which proved that in earlier centuries, all of the principles valleys had been inhabited by people who lived chiefly by agriculture.

The Mormons carried on the work of irrigation by co-operation. The second year, or in 1848, they cultivated 5153 acres, and in 1850 16,333 irrigated acres were under cultivation. These supported a population of 35,000 people. The assessed valuation of taxable property was $1,160,883, or $400 per capita. This shows the rapid increase in wealth of these people as a result of irrigation.

The first attempt at capitalistic irrigation was in 1868 by the Bear Irrigation Company, but it was not until 1889 that the construction of a canal in the Bear river valley, at a cost of $2,000,000, was commenced. Since then other companies have been formed in various western states and the work has been rapidly extended.

Utah may be taken as a fair representative of an irrigated state, being exceeded in amount and percent. of total land irrigated by California with 1.01 per cent., or 1,004,000 acres, and Colorado 1.34 percent., or 890,000 acres, while Utah has only 5 percent., or 263,000 acres under cultivation. One marked advantage in Utah is the great amount of care bestowed upon the land because of the smaller size of the farms and consequently the greater yield per acre. The average size of a farm in Utah is 27 acres, which is the smallest in any of the states in the irrigated region.

In the irrigated regions almost all crops can be successfully raised, but in most parts corn does not do well because of cool nights and in many places not enough wheat is raised for home consumption. In 1889, on one acre near Salt Lake City, 80.1 bushels of wheat were produced, which was the largest yield in the country for that year. An average of six acres on irrigated and non-irrigated land shows that Utah produced 50 percent. more wheat per acre than the average for the United States

and 36 percent. more than Ohio. The yield of the irrigated states was greater than those in the humid regions. During these same years the acreage and yield of the principal fruits increased several hundred percent.

Around Phoenix, Arizona, and in Southern California orchards of citrous fruits are sometimes worth $1800 an acre and the water rent is $45 an inch per acre.

At present about on-third of the irrigable land is under irrigation, but the amount is rapidly being increased. The best use of the water and land is not always made, and much water is allowed to be wasted because of improper systems and lack of dams and ditches. The water most easily obtained is being used and it remains for companies with large amounts of capital to develop the remainder of the country. Many advocate the government doing this and then selling the lands to settlers to cover the cost of irrigation. The work would probably be done best by the government, but there is great opposition to this, especially among eastern farmers.

Mr. J. H. Brigham, Assistant Secretary of Agriculture, and Mr. Aaron Jones, Master of the National Grange, say that it would be unjust to tax the eastern farmers to develop land to produce crops in competition with their own and so lower the prices they get. This view might be compared with the opposition to labor-saving machinery, but most people will concede that the results from the invention of labor-saving machinery are more beneficial than injurious.

In President Roosevelt's first message to Congress he advocated, verv strongly, the construction and maintenance by the government of irrigating plants for reclaiming those parts of the west which would be highly productive if the proper work were done to convey the water where it is needed. Both the President and the Secretary of the Interior, Hon. E. A. Hitchcock, think it would be for the good of the country at large to develop the west in the same manner that the Atlantic States were made more prosperous by the settlement of the Ohio and Mississippi valleys. The products produced there would be used more in developing that part of the country and opening up foreign markets than in competing with eastern farmers. One industry which is capable of great development without competing with the country at large is the raising of sugar beets.

There are some disadvantages of irrigation which it is worth while to consider. Marsh districts are sometimes produced where water is not applied properly, and areas once fertile are more or less injured, especially by the accumulation of alkali. This may accumulate by the evaporation of water where the seepage is not sufficient to produce marshes. The marshes can usually be prevented by drainage and the accumulation of the alkaline salts by flooding and draining. In some regions the scarcity of water is occasionally quite serious, but if the best possible use were made of the water, this would seldom occur. The larger and surer crops obtained by irrigators, good living and general thrift and prosperity, far outweigh the disadvantages.

One kind of irrigation which is almost as useful in humid as in arid regions is sewage irrigation. This is the running of sewage onto farms to prevent contamination of the rivers. Other advantages of this are that the soil is enriched, and water is furnished the growing crops which make surer and larger returns. When proper precautions are taken there are no sanitary objections. One disadvantage is that the

amount of water applied cannot be regulated to the needs of the soil, but must often be applied when the ground is already too wet.

One phase of the irrigation question which should be of greatest importance to farmers in this section is very seldom considered. The great advantages resulting from watering lawns and gardens could in many cases be easily obtained on a larger scale if farmers would only take advantage of their opportunities. The possibility of sufficient rain makes irrigation in the humid regions less necessary and the fear of getting the ground too wet has often prevented the best results being obtained where it is used. Another reason why irrigation is so little used here is because farmers think of it connection with arid lands and consequently are prejudiced against it.

The cost here would be greater than in arid regions, because less improved methods of applying it are used, but where it is possible to irrigate, the increased crops obtained will pay many times the cost in a few years.

Seldom a year comes but some crop suffers from lack of moisture and in seasons like the last one in many parts of this state, in which most crops suffered because of drouth, the advantages to be obtained by irrigation are very manifest.

In this section it is less used than farther east, because farms are larger, land better, less intensive cultivation practiced and a fair return more certain. "Here, where nature has done so much, man has done so little." It is to be regreted that in this advanced section of the country so little has been done to develop this important feature, and that in the near future the farmers will awaken to its possibilities and avail themselves of the opportunity to so materially increase the products of their industry.

ALBERT E. DAY.

Our Seniors.

ALBERT EDWARD DAY was born on a farm at Mt. Carmel, O., in the early eighties. He attended the district school in his own county, entering the Mt. Carmel High school in '93, and graduating in '97. He entered the Ohio State University in '98, pursuing the regular four-year course in agriculture. Mr. Day has given special attention to work in dairying while in school, the subject of his thesis being "Factors Which Affect the Creaming of Milk." He is a member of Townshend Literary Society, Biological Club and the Asparagus Club. Throughout his course, Mr. Day has supported himself almost entirely by his own work, and deserves much credit for his persistence and energy. He expects to return to his native county to engage in practical agriculture.

HERMAN ALFRED CLARK represents the Department of Horticulture and Forestry in the Senior Class and is from Medina County, Ohio. He was graduated from the Medina High school in '96, entering the University two years later. He has done special work along the line of forestry, having been connected with the Bureau of Forestry of the U. S. Department of Agriculture during the summer of 1901.

He is a member of Townshend Literary Society and of Alpha Zeta Fraternity. He has taken an active interest in the work of the former organization, acting as its president for the fall term of 1901, and representing the society on the Makio board last year. Mr. Clark is of a sociable nature and during his course has made many friends both in the University and city. He has taken an active interest in all college events and is a member of the Senior Social Committee. He will probably enter government work again this year.

JOHN THOMAS DALLAS was born in Jefferson County,Ohio,where he received his early agricultural training on his father's farm. He attended the common school during his early years and later the school at Hopedale, in his native county. He entered the University in '93, but having to depend largely on his own resources for support, has been out considerably since that time. The years of '97 and '98 he spent in the gold fields of Alaska, returning to the University in '99. He is an active member of Townshend Literary Society and is at present serving as its president. His genial disposition has made him many university friends, and he has always been popular among the students. The subject of his thesis is "The Need of Cellulose by Growing Ruminants."

LAMOTT RUHLEN comes to us from Union County, where he received the practical experience of farm life in his early years. He was graduated from the New California High school in '97, entering the University the following year. Mr. Ruhlen has shown himself a most earnest and consciencious student throughout his course, and has made an excellent record in class-room work. He has also taken a lively interest in the practical work of the farm and has gained much experience from time spent in actual farm work. He is an active member of Townshend Literary Society, and has held important offices in that organization. The subject of his graduating thesis is "A Comparative Study of Wools From Different Breeds of Sheep of the United States and Canada." He expects to engage in practical agriculture the coming year.

HARRY GLENN BEALE was born near Mt. Sterling, Madison County, Ohio, and was prepared for the University in the Mt. Sterling High school. He entered the University in the fall of '98 and has pursued the four-year course in agriculture. He is a member of Townshend Literary Society and Alpha Zeta Fraternity, representing the latter on the Makio board in 1900-'01. Br. Beal comes from the livestock section of Madison and Fayette counties and during his college course has given special attention to this line of work. He has shown himself a diligent and capabl student and leaves a good record with the University. The subject of his graduating thesis is "The Influence of Rainfall and Temperature on the Production of Corn Throughout the Corn-Growing Regions of the United States."

HERBERT LUCIUS BELDEN is from Geauga County, Ohio. He attended the district school of his home county and later the Middlefield High school, where he went with the object of preparing to enter the course in agriculture at the University. He was graduated from the High school in '97, entering the University the same year and remaining until the spring term of his second year, when he withdrew.' He entered again in the fall of 1900 with the intention of finishing the four-year course. Mr. Belden is a member of Townshend Literary Society and the Asparagus Club, and during his entire course has been a thorough and conscientious student. He has given especial attention to work in animal industry and was one of the students who represented the University in the cattle judging contest at Chicago last year. He is preparing his thesis on "The History of the Channel Breeds of Cattle."

EDWARD LEE SHAW was reared on a farm near Newark, Ohio, where he attended the district school, entering the Newark High school in '94 and graduating 4 years later from the Latin course. Receiving a free scholarship from Lick-

ing county he entered the four-year course in agriculture at the University in '98. He has given much attention to animal industry throughout his University course and was one of the students representing the University at the student cattle judging contest held at Chicago last December. He is especially interested in the raising of sheep and is writing his thesis on "The History and Characteristics of Southdown Sheep."

Different Methods of Cooking Meats.

Cooking answers most important purposes in connection with food; it improves or develops agreeable flavors, especially in animal food, and by action of high temperature on meat, generally agreeable gustatory properties which they do not possess in the raw state, are developed, thus rendering them capable of giving pleasurable excitement to the sense of taste. Cooking also enables food to be more readily masticated and more easily digested. The mastication of animal food is greatly facilitated by cooking, for in the raw state it is tough and tenacious and torn apart with difficulty. After cooking the muscular fibres lose much of their toughness and are far more readily divided by the teeth, while the fibrous tissue connecting them is softened. The digestibility is greatly increased by enabling the digestive juices to come into intimate contact with it and to penetrate readily into its substance. Cooking thus leads to important mechanical and chemical changes which facilitate digestion. Exposure to high temperature also affords a safeguard in destroying parasites or germs which may accidentally be present in it. The effect of a certain degree of heat on meat, is that the albumen is coagulated and the fibrous connective tissues converted into gelatine.

Boiling is one of the simplest and most convenient ways of cooking. When a piece of meat with its surfaces cut across the bundles of fibres is placed in cold water and heat gradually applied, the gelatine and albumen will be steadily drawn from the cut surfaces into the water, and as warmth increases the dissolving of the gelatine, out of the fibrous tissues forming the cell walls and the fibrous network which binds the cells together, grows more rapid. This renders meat soft and loose in texture and the cell walls weak and thin, permitting the escape of the nourishing and flavoring albumen into the water, not merely from cells which were cut, but also from those which were weakened by their walls being dissolved away. As the texture loosens by this continued dissolving away of fibrous tissue, the influence of the water as it warms extends rapidly into the substance of the meat which becomes ragged and flavorless, while the liquid is filled with the albumen and gelatine. If soup is to be made, the above method would be employed, but to retain the albumen, the meat should be plunged into boiling water; by this means the albumenous matter is rapidly coagulated and forms a sort of white-of-egg sheath over the cut surface which retains the juices and soluble constituents in the interior of the meat and prevents their escape into the water, thus keeping the meat juicy, and palatable. After boiling briskly for five minutes, the cooking should be completed at a temperature of 160° to 170° F. If too low a temperature is employed the albumenous matter of the interior will not be properly coagulated, and if too high a temperature be used the muscular fibres tend to shrink and become hard and indigestible. The temperature of

coagulation of albumenous substances differs in different constituents and gelatine of some meats is much softer and more easily dissolved than that of others.

Roasting retains the nutritive juices and extractives more completely than boiling; in order to keep in the juice of meat as much as possible, a joint should be at first exposed to strong heat and afterward cooked more slowly. By this method, as in boiling, the surface layers are at once coagulated, preventing the escape of the juices of the meat. The joint is removed a greater distance from the fire and a lower temperature allowed to penetrate slowly to the interior. By this means the albumen and colored juices of the flesh are slowly coagulated without any great shrinking and hardening of the muscle fibre. Continual basting with the fat is an important part of the process, as it tends to diffuse the heat uniformly over the joint, prevents scorching and too great hardening of the surface. As the surface becomes browned by influence of higher temperature, several new odorous and sapid substances are developed which give to roast meat its characteristic odor and taste; if too strong heat is employed, the fat is apt to undergo decomposition and fatty acids are developed, attended with the freeing of volatile products having a penetrating and disagreeable odor.

Stewing may be regarded as intermediary between braising and boiling, requiring a temperature little above 170° F. The meat cut into small pieces and just covered with water is cooked slowly for some time. Boiling should not occur or the meat becomes tough and hard. Much of the nutritive matter passes into the liquid to which vegetables and other ingredients are added. The whole of the stew being eaten, there is no loss of the nutritive constituents.

Braising is a process in which the meat is just covered with a liquid in a closely covered vessel from which as little evaporation as possible is permitted, and is exposed for considerable time to a surrounding heat just short of boiling. By this treatment the tough fibrous flesh is made tender and easily digestible, moreover becoming filled with the odor and flavor of fresh vegetables and sweet herbs with which it is cooked. In this way meat with little natural flavor, as veal, becomes saturated with substances which render the food delicious to the palate. The braising pan should be provided with a lid so arranged as to contain hot coals or charcoal, which transmits heat downward to the top of the portion not covered by the liquid. To prevent the meat from getting too hot on top, it may be covered with a buttered paper, which will have to be removed each time of basting.

Broiling is the same as roasting, but being applied to smaller portions of meat is a much more rapid process and a far larger surface is exposed to the direct action of the heat. The same principle is applied as in roasting, in order to preserve the juices in the meat. Broiling develops the flavors of the meat very completely and is rapid and convenient.

In baking, the flavor of meat is inferior to that of meat roasted before the fire, for when cooked at a high temperature in a confined space, volatile fatty acids are unable to escape and are therefore retained in contact with the meat.

Frying is a method of cooking meat ill-suited for the purpose of increasing its digestibility. Frying, as usually conducted is rather a combination of broiling, toasting and scorching, and the use of a deep pan of boiling fat, which is essential to a proper performance of the process and especially to preventing

greasiness, is the rare exception. At the moment of contact with the almost boiling fat a thin film of every part of the surface of the object is coagulated, so that the juices and flavors cannot escape. The oil should be in sufficient quantity and hot enough to effect this result at once. L. B. C.

Free Scholarships.

At the last meeting of the Board of Trustees the rule concerning free scholarships was amended to read as follows:

"A free scholarship good for two years in the College of Agriculture and Domestic Science shall be granted to one student annually from each county in Ohio. If in any county there is no applicant for the free scholarship in the College of Agriculture and Domestic Science then a free scholarship good for two years in the College of Veterinary Medicine may be granted.

"Each scholarship is valid two years from the grant and covers incidental and fixed laboratory fees. In the chemical laboratories, a student holding a free scholarship shall be required to pay for materials used and to make a deposit to cover breakage the same as other students."

Heretofore the free scholarships could be used only in the two-year courses and the first year of the four-year courses in the College of Agriculture and Domestic Science. The effect of this rule is to make the free scholarship apply also to the second year of the four-year courses. There are this year just one hundred students on free scholarships at the Ohio State University. The appointments are made by the County Boards of Agriculture. In counties where there is no County Board of Agriculture, it is customary to allow the Farmers' Institute Society to make the appointment.

For further information concerning these scholarships apply to Professor Thomas F. Hunt, Ohio State University, Columbus, Ohio.

Dairy Notes.

The Grout oleo bill passed the United States Senate by a vote of 39 to 31. Before its passage there were a few minor amendments added to it, one of which puts a tax of a quarter of a cent on process butter, the same as uncolored oleo, and another clause puts a tax of ten cents a pound on any butter in which chemicals are used in its manufacture. This is to reach the use of deodorizing chemicals in old butter worked over, or the use of pepsin in adding curd to butter. The effect of the law would be to encourage the manufacture of the best pure butter. Senator Doliver, of Iowa, brought out very forcibly that the oleo manufacturers were sending out color cards to their retailers with instructions to observe the color of butter in their markets and order their oleo according to the color card, that it might correspond to the color of butter in their communities.

The bill has gone back to the House for concurrence by that body. It is claimed that the committee on rules has the power to withold the bill from action and thus defeat it. What will be done remains to be seen.

Herbert Gibson, a former student of O. S. U., has engaged to operate a cheese factory at Phalanx for the Smith Creamery Co., of Cleveland. Only full cream cheese will be made.

Stuart R. Postle has engaged to operate a new cheese factory at East Liberty.

Hazlett Petty will make butter in the H. F. Hidson factory at Windham, Portage county. Fred J. Eldred, who

has been the butter maker at the Summit Station creamery for the past two years, is building a new creamery at Vanatta, four miles north of Newark. Mr. Eldred will look after the business interests of the creamery while Howard Sherman will make the butter.

Knox township, in Columbiana county, has one creamery and seventeen Swiss cheese factories. Smith township, the next township north, in Mahoning county, has eight Swiss cheese factories.

The district northeast of Columbus is becoming a great dairy country. There are creameries at Lithopolis, Pickerington, Etna, Basil, Outville, Summit Station, Newark, Vanatta, Alexandria, Gahanna, Worthington and Westerville, and if we go a little further north we find Galena with one skimming station, Sunbury with four skimming stations, Centerburg creamery with two skimming stations and Jacob Ash's creamery south of Mt. Vernon. The Newark creamery has several skimming stations north and south of there, the Summit Station creamery has a skimming station at Jersey and the Westerville creamery at New Albany. The farmers in this district believe in the cow business and are rapidly improving the value of their farms.

The Formation of Soil From Rock.

Soil has been defined as that portion of the upper stratum of the earth which is capable of supporting vegetation. It is one of the most variable substances known, varying through almost all grades of physical, chemical and mineralogical constitution.

All of the mineral matter of the soil was once solid rock. The principal agencies acting in the conversion of rock into soil, are atmosphere, water and ice, plants, humous acids and carbonic acid. Thus it is readily observed that our soils are produced not by forces within the earth itself, but by those which come to it from beyond its surface. Left to itself, the earth never would have presented any traces of soil.

Perhaps the first step of soil formation was produced by the unequal action of the sun's rays, and subsequent cooling, This expansion and contraction broke up the rock masses. Then rain water containing carbonic acid entered the cracks and froze, effecting a finer division, and dissolving some of the cementing substances. Organic matter then appeared in the form of lichens, and the humrous acids were formed. Later, higher plants followed, sending deep into the joints and crevices, roots which acted as wedges, and by their decay left larger amounts of decomposition products to hasten the process.

The formation of our soil has not been a process of short duration, but the work of many centuries. It is a continuous process and will persist as long as rocks are found near the surface of the earth.

The character of a soil depends very largely upon the rock from which it was formed. If the rock contained much quartz as do the granites, we will find a a large sand content, for quartz has a great power to resist the decomposition agencies. Calcareous matter is readily attacked by carbonic acid and the humous acids; thus, limestones are dissolved by the solution of the calcium carbonate, the impurities, only remaining behind to form the soil. In sandstones, if the cementing substance is calcareous, the rock will soon disintegrate, but if it is siliceous, the process will proceed very slowly.

It is interesting to note that the fertility of a soil depends very largely upon the materials placed in the rocks, from which they were formed, by the action of life of former geological ages. The skeletons of many animals contain much

lime phosphate which passes into the strata and later, is formed into rock. The surprising fertility of the Kentucky blue grass region is due to the presence of abundant remains of animals in the underlying rock. This accounts, too, for the fertility of other limestone soils, especially with reference to their content of phosphoric acid. This same material under certain conditions has produced the famous rock phosphate beds of our Southern States.

It is well that the process of soil formation is a slow one. By the destruction of rock masses, plant food is liberated in a soluble form and in amounts seldom exceeding one-tenth of one percent. of the soil mass. Being in solution, it is essential that it be assimilated by the roots of plants. If it is not thus absorbed, or is in excess, this soluble material readily enters into the general mass of water and soil and escapes into the streams. C. A. McC.

Some Notes on Timber Physics.

Timber Physics is the science which treats of the physical properties of wood or timber. These physical properties are of very great economic interest to all who use timber for any constructional purposes, for it is by means of this science that we come into possession of the facts which enable us to choose the best timber for a given purpose.

A full outline of this subject would require a small volume, hence we can only give a few bare facts, mostly on comparative strength tests.

One of the questions which has disturbed the minds of men engaged in practical construction work has been how far data obtained on small laboratory pieces are applicable to construction members of the size used in practice.

To determine how far size influences test results two independent series were instituted, in the experiments from which these notes were taken, one with beams and columns of commercial size, from which afterwards smaller sizes were cut and tested; the other was on small laboratory sizes only, in which it was attempted to find the size which furnishes the most satisfactory results, and also to determine what may be reasonably considered a real difference in strength not chargeable to the error of workmanship or machine, but to inherent lack of homogeneity of material, and therefore a difference of practical significance.

Since moisture has been shown to have a very marked effect on the strength of timber, a series of moisture tests were also instituted along with the series of experiments.

The most important conclusions of the experiments may be briefly stated at the outset, as follows:

a. A difference in strength values derived from a few specimens of the same kind of wood, up to 10 percent. for coniferous wood and to 15 percent. for hard woods, cannot be considered a differences of practical importance; such difference cannot be relied upon as furnishing a criterion of the quality of the material.

b. The size of the test piece does not in itself influence strength values (except in compression endwise when the size is less than a cube).

c. Small test pieces judiciously selected, furnish a better statement of average values of a species than tests on large beams and columns in small numbers.

d. A large series of tests on small pieces will give practically the same results as such a series on large beams and columns; hence, there is no need of finding a coefficient, with which to relate the results of the former to construction members.

e. The influence of moisture on strength appears even greater than was heretofore supposed.

f. The strength of beams at elastic limit is equal to the strength of the material in compression, and the strength of beams at rupture can, it appears, be directly calculated from the compression strength; the relation of compression strength to the breaking load of a beam is capable of mathematical expression.

EFFECTS OF WATER SOAKING.

A series of 132 compression endwise tests on pieces of white pine, long-leaf pine, tulip tree, oak and ash made in the same manner as is usual for ordinary green timber, but on material which had been yard dry and then soaked in cold water for over four months, showed that this soaked material behaved very much like the green material, displayed but little less uniformity, and that the difference between soaked and dry material was about the same as between green and dry material. Water soaking, however, has a markedly beneficial result on the lasting properties of wood, since it removes many of the substances on which insects and fungi live.

EFFECTS OF SIZE ON STRENGTH IN BEAM TESTS.

I. The difference between the values for the large beam and the average for the small beams is not at all constant, either in character or quantity; the large beam may be stronger (20 percent of the cases) or practically as strong, *i. e.*, within 10 percent (57 percent. of the cases), or it may be weaker and vary often considerably from the average (23 percent. of the cases).

Of 696 tests on small beams 235 furnished results smaller than that of the large beam. Again, out of 396 small beams, fully 40 per cent. were weaker than the large beam, while of another series of 300 only 24 per cent. gave lower values.

II. There are in every case some small beams which far excel in strength the large ones; even in such cases where the average strength of the small beams is practically the same as that of the larger beams, some small ones show values 25 to 30 per cent. greater than the large beams.

III. In only 6 per cent. of the cases each of the small pieces gave a higher result than was obtained from the large beam, but in these cases the latter was evidently defective.

IV. In all beams the differences observed between the several small beams themselves are far greater than that between the average value of the small beams and the value of the large from which they are cut.

From these observations, which are fully in accord with the observations on the numerous tests of the large general series it would appear that:

a. Size alone cannot account for the differences observed; and, therefore, a small beam is not proportionately stronger because it is smaller, for it may be either stronger or weaker; but that if it is stronger, the cause of this lies in the fact that the larger beam contains weak as well as strong wood, besides other defects which may or may not appear in the small stick.

b. Generally, but not always, a large timber gives values nearer the average, since it contains, naturally, a larger quantity as well as a greater variety of the wood of the tree, and, therefore, also:

c. Small beams, for the very reason of their smallness, containing, as they do, both a smaller quantity and variety of the material, give results which vary more from the average than results from large beams, and, therefore, can be uti-

lized only if a sufficient number be tested; but it also appears that

d. To obtain an average value, even a very moderate number of smaller pieces, if they fairly represent the wood of the entire stem, give fully as reliable data as values derived from a large beam.

e. Average values derived from a large series of tests on small but representative material may be used in practice with perfect safety, and these averages are not likely to be modified by tests on large material.

It might be added that both the practicability and need of establishing a coefficient or ratio between results from tests on large and small beams or columns falls away. To deserve any confidence at all, only a large series of tests on either large or small beams would satisfy the requirement of establishing standard values, while a series of small pieces has the preference, not only on account of greater cheapness and convenience in establishing the values, but still more for the reason that only by the use of small, properly chosen material it is possible to obtain a suffiently complete representation of the entire log.

The few facts herein stated serve only to point out in a cursory manner the scope of timber physics and to give a general idea of the immense opportunities for work along this line.

E. D. COBERLY.

The problem of regrassing the western plains which have become barren by close grazing is being taken up by the railroads running through that territory. They have bought large tracts of the land which they propose to fence off and divide into plats for testing the various grasses. It is probable that the government will aid the enterprise in time, since it has already done considerable along this line. The plan is very indicative of the enterprising methods of these railroads and it is hoped that much good will come from it. If a grass could be found that would thrive on these plains, the result would be of incalculable value to the country.

Spraying for the San Jose Scale Louse.

Various mixtures have been proposed for this insect and a number have been found to be more or less effective. It is hardly possible, however, to apply any remedy with such thoroughness as to reach every scale, and because its natural enemies are few and its rate of reproduction very rapid, complete eradication is practically impossible, but by treatment each season it is entirely practicable to hold it in check. The choice of a compound with which to make treatment is not to be determined alone by its efficiency, but by its availability and practicability as well. Resin washes, composed of resin, potash and fish oil, have been found to be efficient, but are troublesome to prepare in a small way. The same is true of a whitewash made of lime, sulphur and salt. Whale oil soap, when used as strong as two pounds to a gallon of water, and applied with thoroughness, is a great remedy. Its cost precludes its use in many cases and the difficulty of finding suitable weather conditions for the application of it make results with it quite variable. While not without objections, crude petroleum has been found, in most cases, to meet the requirements better than any other remedy yet tried at the Ohio Experiment Station. The thin, light grade is safer and less troublesome to use than the thick, heavy grade, although when diluted with water the latter is less objectionable than if used clear. Refined oil is more harmful than crude.

Good results have been secured in spraying scale infested trees with 25 percent. of crude petroleum and water, also with higher percentages of oil. Trees have been injured, and even killed, with 25 percent. of oil. On the other hand many thousands of trees in all parts of the country have been sprayed with clear crude petroleum, and with various percentages, without injury.

The manner of spraying has much to do with the effect upon the trees. When the material is applied in such quantities as to run down the limbs and bodies of the trees injury is almost sure to occur, even if the oil is diluted with water. Sometimes the operator, trusting to dilution to prevent damage, sprays excessively, or until the mixture runs down to the roots. The oil thus unevenly distributed and unknown quantities reach certain parts of the tree, resulting in local injury.

Peach trees are very tender and should be sprayed with more than ordinary care. If whale oil soap is used the work should be done just as the buds are swelling.

The only safe way is to stop spraying before the material begins to run, and this rule applies to diluted as well as to clear crude petroleum. With a suitable pump, like the Spramotor, 25 to 50 percent. crude petroleum can be used safely and economically, but if the pump cannot be relied upon to give accurate percentages then clear crude petroleum may be applied with any pump. A nozzle which will give a fine spray is needed in all cases, and for this purpose the Vermorel is satisfactory. Choose a day for spraying with crude petroleum when evaporation is rapid, as greater injury is done in damp than in drying weather. If the sun shines and the wind is blowing, all the better. A light wind is not advantageous but a brisk or high wind assists operations materially. When there is no wind begin at the top of the tree, spraying around the tree, and work downward rather than upward. Avoid double applications, such as may result by spraying up and down the tree. If the wind is brisk hold the nozzle high and let the material drift through the trees. In this way trees some distance away may be covered almost as well as those near by. The operator must shift his position and change the height of the nozzle as experience shows to be necessary. When the wind changes another application must be made on the other side of the trees. There is less danger of overspraying in a high wind than when the air is calm, but there is also a greater probability of missing parts of trees. In early spring, just before the buds open is the best time to spray, although no harm may be done if the work is performed earlier. The work can be done much better if the trees are first severely pruned by cutting off the ends of the branches. In case trees are seriously infested this operation is necessary in order to secure good results, after removing one-third or one-half of the top. Peach trees will endure very close pruning and no harm will be done if the top is all cut away and a new one started. Close pruning also assists the trees to recover from the weakening effects of the scale.

It is seldom advisable to destroy trees because of infestation, but it is usually better to prune and treat than to dig out, because new trees put in place of the old ones would soon become infested.

W. J. GREEN, Horticulturist.
Ohio Experiment Station.
—Press Bulletin.

David E. Houston, M. A., Professor of Political Science in the University of Texas, has been elected president of the Texas Agricultural and Mechanical College.

Rural Social Improvements.

The rural social problem is one that is beginning to command the attention of our best thinkers. It is universally conceded that the rural population is the regulator of the machine of government, yet the needs of the individual and of the people as a whole have been largely disregarded. The time is coming, however, when the nation will look more to the development of agriculture and to the uplifting of the rural population. That this change is rapidly taking place is evidenced by the great development in our agricultural colleges and experiment stations within the last decade, and the attitude of the government toward such advancement is shown by the development of the United States Department of Agriculture.

While considerable has already been done toward bettering the condition and methods of our agriculturists, it is but a beginning, and the means by which a fuller development may be attained are in large part, still to be worked out. Such methods will necessarily depend fundamentally upon education, while connected with this there are other features more or less dependent upon it. A recent article in the Review of Reviews by Kenyon L. Butterfield is worthy of consideration in this connection. The paper treats of the confederation of our rural forces and names the school, the church and farmers' organizations as the three great rural social institutions. None of these, the author states, are doing their whole duty, although all are awakening to their opportunities and all must grow if the problem is solved. The problem is to secure both "the spirit and form of cooperation among these institutions so that each may understand its true province and appreciate the function of the others."

While the methods of solving this problem are not easily seen, the following plans are suggested:

"(1) Let the agricultural colleges in each state take the lead in the movement, acting not so much as an organization as a clearing-house and go-between. Let it direct conferences on the subject and seek to bring all who are interested in rural affairs into touch and sympathy. (2) Have a league for Rural Progress made up of representatives from the churches, the agricultural colleges, the departments of public instruction, the farm press, various farmers' organizations, etc. (3) Enlarge the Hesperia movement which now seeks to secure co-operation between school and farmers' organizations by including in it the church." The author concludes that "it is perfectly obvious that the first and most important step in bringing about a federation of rural forces is to educate all concerned to the desirability of such a federation—to sow the seeds of the idea."

The initial step in this movement has been taken by the Michigan Political Science Association, a joint meeting of that organization and the farmers' institutes of the state being held recently at the Michigan Agricultural College. The session covered two days, the first being given to a discussion of educational, social and industrial problems, and the second to technical agriculture. One of the most important papers read was on "Rural School Consolidation," and thus went to the root of the whole matter—the improvement of our rural schools. The meeting was attended by farmers, agricultural students and members of the Political Science Association and was a marked success.

The advantages of such a movement as this, can it be carried out, are evident; but the obstacles to be overcome, and the time necessary for its development

are necessarily great. The growth of new ideas in regard to social development among the rural classes proceeds slowly, and all such measures require time; but this should be no argument against their desirability. The only way to accomplish the desired result will be to keep agitating reforms;—we should do all possible toward the improvement of schools, aid in every conceivable way the furthering of agricultural education, both by means of agricultural schools, and by the direct method of agricultural extension work and farmers' institutes, and foster to the greatest extent possible all features which promise a bettering of social conditions. In this work all who are interested in the development of agriculture may aid, and to do their full duty it is imperative that they should. We have a duty to perform in this respect, and should seize every opportunity that is offered to aid the cause of agricultural development and of rural social betterment.

Some Features of Greenhouse Management.

Probably no other line of horticultural work is as profitable as that of the greenhouse when properly managed. It is used in growing both flowers and vegetables to good advantage. The forcing of winter vegetables is a very profitable work and most all horticulturists are coming to realize this. All who have tried it and managed it properly have had success.

There is a great demand for anything in the vegetable line out of season. But success depends solely upon the management. As the kind of greenhouse used determines to a great extent the practicability of the management, care should be exercised in choosing material and in the building of the house.

There are several forms of greenhouse that can be used, but probably the "even-span" house is the better. This form of house should run north and south and mav be arranged on the ridge and furrow plan, that is, two houses side by side, so that the one inside gutter answers for both houses. The walls are most commonly made of wood, which makes a very good wall, as wood does not transmit heat as rapidly as stone or brick, which is a serious objection.

There should be a double row of ventilators along the ridge of the house, hinged to the ridge so that the house can be properly ventilated. The house may be heated either by steam or hot water, although the latter is probably more economical and answers the purpose as well, if not better, than steam.

The arrangement of the inside of the house will depend somewhat upon the crop to be grown. Lettuce is the crop most commonly forced, and for that reason it will be well to consider the arrangement of a lettuce house.

Lettuce houses should not be less than twenty feet wide, but may be more and yet prove satisfactory. The benches may be either raised or solid, a common plan when three beds are used in houses twenty feet wide being to have one solid bed in the center and raised benches at the sides, or the arrangement may be reversed. They should be just as high as the manager can conveniently reach across and be built of good material, for the benches are always a source of trouble. Unless built well they will leak or break down and generally decay in a few years. At least one bed should be arranged with heating pipes so as to have bottom heat for propagating certain plants.

The best method of watering is by sub-irrigation, which is effected by laying two-inch drainage tile end to end in the bottom of the bed. The ends are left open so that a hose can be inserted

and the water is thus applied to the bottom of the bed instead of the surface.

The soil used in the beds is about six inches deep and composed of good garden soil and horse manure thoroughly mixed. Too much manure should not be used, as it will cause the disease called "damping off," which is much dreaded by lettuce growers.

The temperature of lettuce houses should be kept below 50° F. at night and in dull weather, and 60 degrees during the day. The houses should be kept well ventilated, using the sash that opens opposite to the direction of the prevailing wind whenever this is possible. By using the double row of ventilators hinged to the ridge this can easily be effected.

The most troublesome pest in lettuce growing is the green fly or Aphis, but this can be kept in check by the use of tobacco stems if taken in time. It is well to cut them up by passing them through a hay cutter or coarse seive and then scatter the pieces over the beds which will tend to keep the fly in check. As soon as the presence of the fly can be detected the houses should be filled with tobacco smoke. This should be repeated at the end of two or three days and if properly done, the Aphides will be destroyed. As the insects develop, the tobacco smoke does not seem powerful enough to destroy them, and if for any reason fumigation has been neglected too long to be effective, resort must be made to some other insecticide. A strong decoction of tobacco stems and tobacco extract will destroy them, while pyrethrum or buhach seems quite effectual as a remedy against the adults, and may be put on as a dry powder with a bellows, or in water with a syringe, using at the rate of a tablespoonful to a gallon. When the houses are large a small spraying pump will be convenient for applying these and similar insecticides.

When proper conditions are observed three crops a season can be grown, and if it is of fair quality it will bring a good price.

The radish is another vegetable which is grown under the same conditions as lettuce and which is very profitable. Besides the various vegetables, such as lettuce, radishes, tomatoes, cucumbers, melons, mushrooms, cauliflowers, etc., a great many flowers are raised in the greenhouse. Flower growing is coming to be so profitable that a great many greenhouse men have devoted their whole house to the growing of such flowers as roses, carnations, chrysanthemums, etc., to the entire exclusion of the vegetables. T. L. WHEELER.

Book Reviews.

ALFALFA.—A practical treatise on the production, qualities and uses of this valuable plant, especially in the United States and Canada. By F. D. Coburn, Secretary Kansas State Board of Agriculture. Illustrated, 12 mo., 160 pp., cloth. Orange, Judd Co., New York. Price, postpaid, 50 cents.

No forage crop has ever attained such a degree of favorable prominence in the United States within a single decade as that acquired by alfalfa in the last ten years. Although by no means new to agriculture elsewhere, it is comparatively new to the farmers of most sections of the United States and Canada, who are now discovering in it one of the most valuable and productice crops on all lands to which it is adapted.

Secretary Coburn, who has been very actively and helpfully identified with the development of this and other of the more recent valuable agricultural plants, has in this practical treatise presented the best that is known on the growth,

uses and feeding value of alfalfa, thoroughly discussing the subjects in all their bearings in language so plain as to be clearly understood even by those entirely unfamiliar with the plant. He has carefully collected the data regarding its growth in each state, giving the observations of both farmers and scientists. The book is the most complete collection of facts regarding this plant that is available, and is worthy of a place in the library of every modern farmer.

ACCORDING TO SEASON.—A book for the nature lover. A charming addition to the series of nature study volumes so rapidly increasing in popularity. By Frances Theodora Parsons. Cloth, 200 Charles Scribner's Sons, New York. Price, $1.75 net.

The remarkable interest that is awakening in the minds of people regarding nature and her beauties is a noted feature of our present life. People are coming to appreciate the beauties of nature as never before and each season more and more city people are turning countryward both for pleasure and profit. Connected with this development has come the appearance of various books on nature and nature study. "According to Season" is a charmingly written volume, combining in a popular and fascinating manner the art of simple portrayal with the enumeration of a host of valuable facts regarding the birds and flowers of the different seasons.

A chapter on nature in winter, leads well into the methods of the author, and illustrates the keen powers of observation in the true nature lover. From this the narration—for it may almost be termed such—runs into early spring, the first glimpses of opening life, then the bursting beauty of May and the "leafy month of June." Observations on flowers and birds gathered from intoxicating open-air rambles, the joy of life to a nature lover, the changing forms of plant and bird life are gathered into a pleasing combination. Things are seen through the eyes of a most observant and appreciative nature lover with an interest that does not lag with the changing seasons. The book is beautifully illustrated, containing over thirty full page colored plates of the more common and beautiful wild flowers.

SONGS OF THE WESTERN COLLEGES.—Hinds & Noble, New York City. Cloth, 200 pp. Price $1.25.

This is a companion volume to the splendid book, "Songs of All the Colleges," recently published by the same house. The compilers have endeavored to secure all of the songs of the western colleges and place them in a book which would not only reveal these native west-

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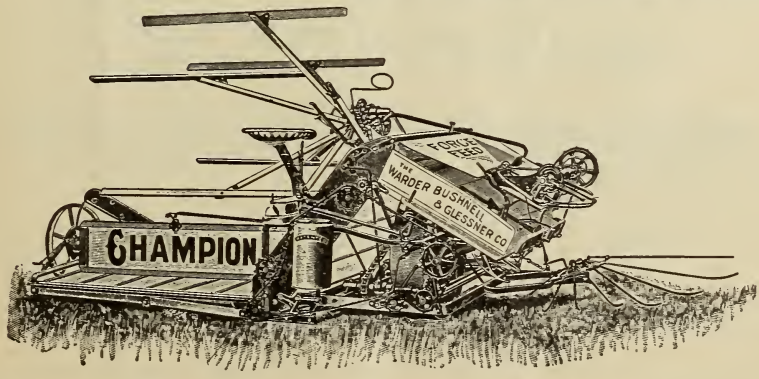

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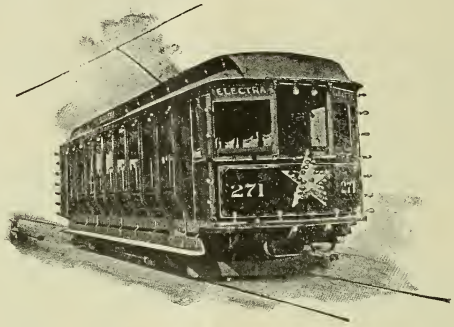

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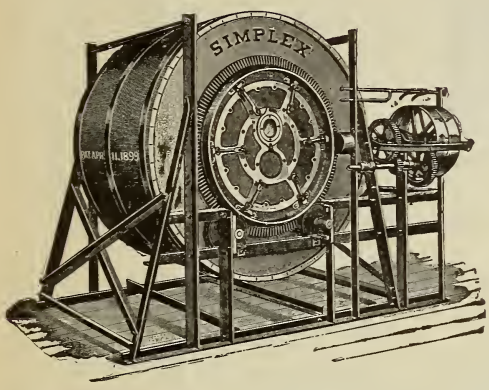

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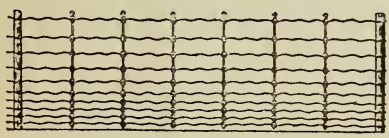

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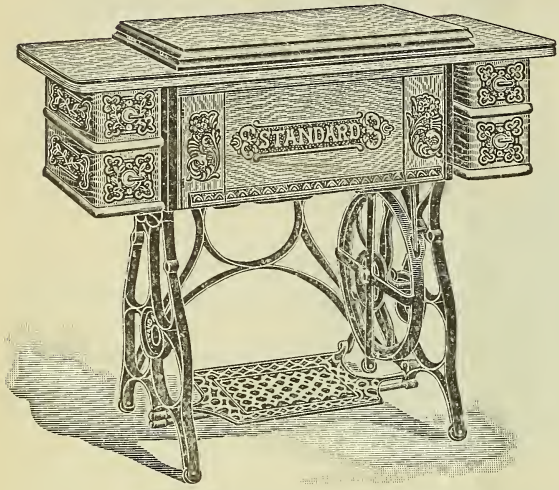

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